

## NEST AND PREY OF *WILLIAMSITA BIVITTATA* (TURNER) (HYMENOPTERA: SPHECIDAE: CRABRONINAE).

D.B. McCORQUODALE<sup>1,2,3</sup>, C.E. THOMSON<sup>2,3</sup> and V. ELDER<sup>2</sup>

<sup>1</sup> Department of Zoology, Australian National University, GPO Box 4, Canberra, ACT, 2601

<sup>2</sup> 4 Watt St., Campbell, ACT, 2601

<sup>3</sup> Present address: 19 Eiginfield Dr., Guelph, Ontario, N1E 4E5, Canada.

### Abstract

Six nests of *Williamsita bivittata* (Turner) from a log of *Eucalyptus* sp. were examined. The prey (adult Diptera) and the nest architecture were recorded and compared with those of closely related wasp genera, *Lestica* and *Ectemnius*.

### Introduction

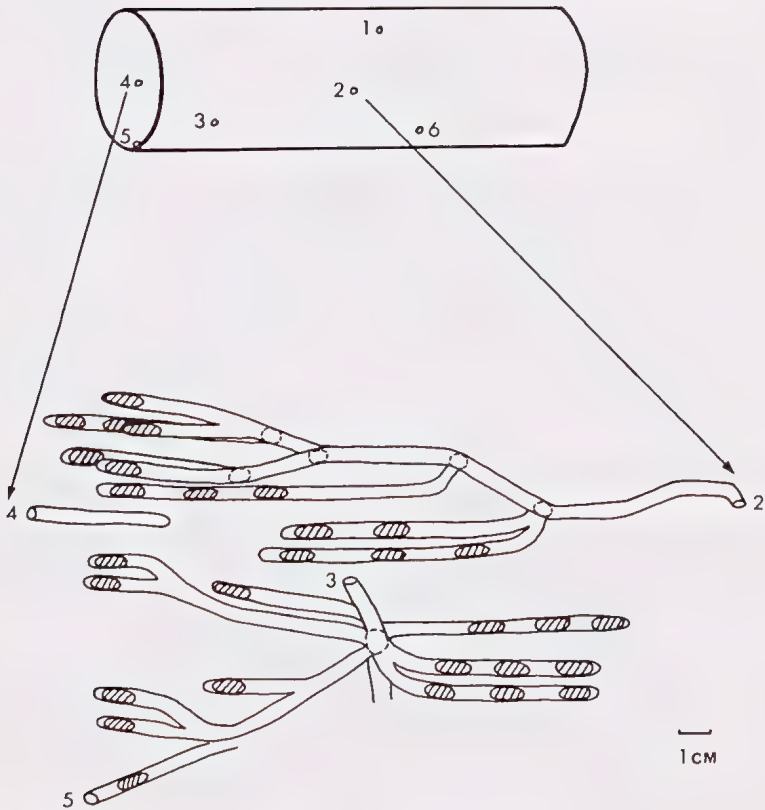
The eight species of *Williamsita* Pate are found only in Australia and New Caledonia (Bohart and Menke 1976, Cardale 1985). Evans and Matthews (1971) reported the natural history of the genus, noting that nests of *W. bivittata* (Turner) occurred in a willow log and their prey were adult Diptera, *Calliphora tibialis*. Here we confirm and expand on these details based on nests found in Canberra, ACT. All specimens of adult females, immature stages and prey have been deposited in the Australian National Insect Collection, CSIRO, Canberra.

### Results and Discussion

A log of *Eucalyptus* sp. (40 cm long x 13 cm diameter, Fig. 1) in a suburban garden with three holes exuding frass was noticed on 13 December 1987. The log formed the border between a flower bed and a lawn. From 1-3 January 1988, female wasps carrying adult flies entered those holes several times between 10:00 and 14:00 (EDT). At approximately 1900 hrs (EDT) on 3 January a dead adult female of *W. bivittata*, minus wings, was dragged from one of the holes by ants (*Iridomyrmex* sp.). At 0700 hrs (EDT) on 4 January the log was placed in a plastic bag and dissected later the same day. The upper parts of the log were dry from exposure to the sun for most of the day, while the lower parts and the inside were moist and very soft.

Three more entrances were discovered during dissection, indicating a total of six nests. The nests filled most of the centre of one end of the log, with some extensions towards the other end (Fig. 1). Details of four of these nests are shown in Fig. 1. Despite the close proximity (<5 mm) of branches of the various nests, no interconnections were found. Most branches of the main nest tunnels

and the cells themselves were parallel to the long axis of the log. The tunnels connecting the branches and leading to the entrance varied in orientation. Many tunnels and branches were dichotomously branched and a few were 3-branched (e.g. Nest 3). Cells varied in length from 11 to 20 mm and were about 6 to 8 mm in diameter. The main tunnel and branches were of a similar diameter. Between cells there was a 5 to 10 mm plug of frass, wood manipulated by the wasps and resembling sawdust. Other parts of the main tunnel and branches were also plugged with frass.



**Figure 1:** Diagrammatic representation of nest log and detail of parts of four nests of *Williamsita bivittata*. The detail is a side view through a section of the log. Nest cells are hatched. Several branches of nests 2 and 3 are not shown.

Eighty nine cells were examined, representing about 70-80% of cells in the log. Most could not be assigned to a specific nest and all contents of many were not recovered, so the following data refer to 43 complete cells, first those with immature wasps, then those without immature wasps. Three cells contained only pupal cases of *W. bivittata* and the remains of consumed prey. Six cells had large larvae (head width 1.4 mm, body length 12 mm, n=1) and the remains of consumed prey. Ten cells had smaller larvae and at least one complete fly. One cell contained a fly with an egg (2.3 mm long) attached ventrally between the head and prothorax, at right angles to the long axis of the fly. The fly with the egg was the furthest from the cell entrance and therefore the first prey to be placed in this cell. Two very small larvae were found in the same position on flies in other cells and both of these flies were the furthest from the entrance in their respective cells. All flies in these three cells had their heads pointing away from the nest entrance. These observations suggest that the egg is regularly laid on the first prey placed in the cell. The remaining cells lacked evidence of wasp residency. Fifteen cells contained mouldy and/or partly consumed flies and frass intermixed and no wasp pupal case. These could result from no egg being laid, death of the wasp, or nest parasitism. Two cells with the full complement of prey but no wasp egg or larva were found. One cell had a small (1.1 mm long) dipteran larva, probably a chloropid. One cell contained an unidentified dipteran pupa. Two cells contained muscoid larvae, presumably these larvae emerged from larviporous species of prey in the cell.

The prey were all adult flies of the families Calliphoridae, Stratiomyidae and Therevidae (Table 1). Cells were provisioned with 4 to 11 prey ( $\bar{x}=6.61\pm 2.43$  (s.d.), n=13). Several cells included flies of at least two families. Both sexes of some common flies in suburban Canberra were represented (e.g. *Calliphora tibialis*, *Odontomyia* sp.).

Six females of *W. bivittata* were collected. Three were associated with specific nests. It is assumed that each nest was occupied by one female. The females varied considerably in size, as measured by head width ( $\bar{x}=2.68\pm 0.36$  mm (s.d.), range 2.35-3.20 mm). The largest female occupied the nest with the largest cells.

*Williamsita* is closely related to the widespread genera, *Ectemnius* and *Lestica* (Bohart and Menke 1976), which include some species that nest in decaying wood and others that dig nests in the ground. Adults moths are the usual prey of *Lestica*. *Ectemnius* prey includes several orders of insects, with adult Diptera predominating (Tsuneki 1960). The behaviour of *W. bivittata* is within the range of these related genera. Within the Crabronini, laying the egg across the "throat" is the rule (Iwata 1976), adult Diptera are the most frequently used prey and several genera include species that nest in decaying wood (Bohart and Menke 1976). Evans and Matthews (1971) concluded that crabronine wasps in south-east Australia exhibited behaviour and prey use consistent with "typical" crabronines elsewhere. Our observations of *W. bivittata* are consistent with this interpretation.

**Table 1:** The adult Diptera and numbers found in nest cells of *Williamsita bivittata*.

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Calliphoridae	
<i>Calliphora tibialis</i> (Macquart)	26
<i>Calliphora dispar</i> (Macquart)	4
<i>Calliphora</i> sp.	7
<i>Stomorhyna discolor</i> (Fabricius)	1
<i>Stomorhyna subapicalis</i> (Macquart)	2
Stratiomyidae	
<i>Odontomyia</i> sp.	22
Therevidae	
<i>Agapophytus</i> sp.	1

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